CLAIMS

1. A method for etching a polysilicon gate structure in a plasma etch chamber, comprising:

defining a pattern protecting a polysilicon film to be etched;

striking a plasma;

etching substantially all of the polysilicon film that is unprotected;

introducing a silicon containing gas; and

etching a remainder of the polysilicon film while introducing a silicon containing gas.

2. The method of claim 1, wherein the method operation of introducing a silicon containing gas includes,

flowing the silicon containing gas at a flow rate between about 0.1 standard cubic centimeters per minute (sccm) and 300 sccm.

3. The method of claim 1 wherein the silicon containing gas is selected from the group consisting of Si_2H_6, SiH_3CH_3, $SiH(CH_3)_3$, SiF_4, $SiCl_4$, $SiHCl_3$, SiH_2Cl_2, $SiBr_4$, and Tetraethyl orthosilicate (TEOS).

4. The method of claim 1, wherein the silicon containing gas is one of SiF_4 and $SiCl_4$.

5. The method of claim 1, wherein the method operation of etching substantially all of the polysilicon film that is unprotected includes,

executing a first etch to remove a hard mask; and

executing a second etch to remove the polysilicon film that is unprotected.

6. The method of claim 1, wherein the method operation of etching a remainder of the polysilicon film while introducing a silicon containing gas includes,

preventing notching at a base of the polysilicon gate structure.

7. The method of claim 1, wherein the method operation of introducing a silicon containing gas includes,

terminating the etching of the polysilicon film that is unprotected; and

striking an over etch plasma.

8. The method of claim 1, further comprising:

forming a passivation layer from byproducts generated from the etching of the polysilicon film.

9. A method for decreasing etch rate micro-loading between differently doped material of a substrate, comprising:

striking a plasma in a chamber;

etching the substrate;

forming a passivation layer from byproducts generated from the etching; and

enhancing the passivation layer.

10. The method of claim 9, wherein the method operation of enhancing the passivation layer includes,

flowing a silicon containing gas into the chamber during the etching.

11. The method of claim 10, further comprising:

flowing the silicon containing gas between a flow rate of about 0.1 standard cubic centimeters per minute (sccm) and 300 sccm.

12. The method of claim 10, wherein the silicon containing gas is selected from the group consisting of Si_2H_6, SiH_3CH_3, $SiH(CH_3)_3$, SiF_4, $SiCl_4$, $SiHCl_3$, SiH_2Cl_2, $SiBr_4$, and Tetraethyl orthosilicate (TEOS).

13. The method of claim 9, wherein the differently doped material is selected from the group consisting of n-doped material, p-doped material, and undoped material.

14. The method of claim 9, wherein the silicon containing gas is one of SiF_4 and $SiCl_4$.

15. A semiconductor processing system, comprising:

a chamber, the chamber including,

a gas inlet;

a top electrode configured to strike a plasma inside the chamber; and

a support for holding a substrate;

a controller configured to detect a passivation starved condition during an etching operation, wherein in response to the passivation starved condition, the controller is further configured to introduce a passivation enhancing gas through the gas inlet during the etching operation.

16. The system of claim 15, wherein the controller is a general purpose computer.

17. The system of claim 15, wherein the passivation enhancing gas is a silicon containing gas.

18. The system of claim 17, wherein the silicon containing gas is selected from the group consisting of Si_2H_6, SiH_3CH_3, $SiH(CH_3)_3$, SiF_4, $SiCl_4$, $SiHCl_3$, SiH_2Cl_2, $SiBr_4$, and Tetraethyl orthosilicate (TEOS).

19. A method for enhancing a polysilicon to oxide selectivity during an etching process, comprising:

providing a substrate to be plasma etched in a chamber;

striking a plasma in the chamber; and

depositing a thin layer of a silicon containing oxide over a gate oxide as the substrate is being etched.

20. The method of claim 19, further comprising:

flowing a silicon containing gas into the chamber while performing an over etch step of the etching process.

21. The method of claim 19, wherein the method operation of depositing a thin layer of a silicon containing oxide over a gate oxide as the substrate is being etched occurs during an over etch step of the etching process.

22. The method of claim 19, wherein the method operation of depositing a thin layer of a silicon containing oxide over a gate oxide as the substrate is being etched causes a polysilicon to oxide selectivity to increase so as to prevent any etching of the gate oxide.

23. The method of claim 20, wherein the silicon containing gas is selected from the group consisting of Si_2H_6, SiH_3CH_3, $SiH(CH_3)_3$, SiF_4, $SiCl_4$, $SiHCl_3$, SiH_2Cl_2, $SiBr_4$, and Tetraethyl orthosilicate (TEOS).

24. The method of claim 20, wherein the silicon containing gas is one of SiF4 and $SiCl_4$.

25. The method of claim 19, wherein the method operation of depositing a thin layer of a silicon containing oxide over a gate oxide as the substrate is being etched includes,

providing oxygen from an oxygen source for the silicon containing oxide.

26. The method of claim 25, wherein the oxygen source for the silicon containing oxide is one of a component in the chamber and an oxygen containing feed gas.

27. The method of claim 26, wherein the component is one of quartz and alumina.

28. The method of claim 26, wherein the oxygen containing feed gas is selected from the group consisting of O_2, N_2O and CO_2.